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A PRESSURIZING DEVICE FOR A CAMERA CASE DESIGNED FOR USE IN SHALLOW WATER

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(Plate I and Text-fig. 1)

With the exception of a few specially designed models, most under-water cameras today employ no means of pressurizing, or at best merely have a Schrader valve fitted to the case which can then be pressurized, prior to each dive, with a few strokes of a bicycle pump. This method has one severe drawback in that the majority of camera cases are better able to withstand external rather than internal pressure. The chances of a case exploding or blowing a gasket while pressurized prior to a dive are far greater than those of implosion of a non-pressurized case in a comparable depth of water.

Since pressurization is desirable, particularly in camera cases made of Perspex, the logical solution is a pressurizing device working on the same principle as the aqualung. This would permit the case to be pumped up automatically as it was taken into deeper water and thus never be subject to the chance of explosion or implosion. An aqualung, however, requires a self-contained source of air, and for a small camera case the cylinder must not be too large. It was found that Sparklet bulbs containing compressed CO_2 for making soda water were a convenient size and contained approximately 3 l. of gas. The case in question is designed for an Agfa Silette 35 mm camera and has a volume of about 1 l. One Sparklet bulb therefore permits pressurizing down to depths approaching 30 m.

The total pressurizing unit consists of a small demand-valve, a simple on/off valve (Fig. 1 *o.o.v.*) taken from a butane picnic stove, a brass adaptor (*a*) and a Sparklet bulb holder (*b.h.*) carrying the Sparklet bulb (*S.b.*). The adaptor has two functions: initially it enables the bulb holder to be screwed on to the rest of the unit as the threads on the holder and on the on/off valve are not identical; secondly it permits a gas tight union to be made between the Sparklet bulb and the on/off valve. The seal between bulb and adaptor is made by a small length of P.V.C. tubing fitted over the neck of the bulb which is compressed into the tapering orifice of the adaptor. The seal between the adaptor and the on/off valve is made with hemp and jointing compound. The pressure in the bulb is initially very high, being in the region of 4500 lb./sq.in., but the seals described have proved satisfactory. The Sparklet bulb is broached

by a steel needle (*n*) located at the inlet of the on/off valve, and the adaptor is of such dimensions that the steel needle just pierces the soft cap of the bulb when the holder is screwed fully home. The outlet of the on/off valve is threaded and screws into the inlet of the demand-valve, the seal being made with hemp and jointing compound and a lead washer.

The demand-valve is adapted from pieces taken from a Siebe–Gorman 'Salvus' breathing set. It is made of brass and consists of an irregular cylindrical chamber open at both ends. Through one side of the chamber comes the inlet tube (*i.j.*) which extends to the middle of the chamber and has an orifice in the form of a jet on its lower side. The larger, upper end of the chamber is sealed from the outside by a strong rubber diaphragm (*d.v.d.*) held in place by a threaded ring (*r*). Attached to the diaphragm is a brass cylinder (*c.c.*) threaded on the inside, and with a slot in it to fit over the inlet tube. The cylinder is free to slide up and down the chamber, its movement being limited by the flexibility of the diaphragm. A brass plug (*s.l.p.*) with a piece of P.V.C. glued to its face and a square lug on the back is screwed into this cylinder from the lower end until the P.V.C. is about 1 mm from the inlet jet. The plug is prevented from altering its setting by a washer (*w*) with a square hole and a single lateral projection which locates with the slot in the cylinder. A spring between this washer and the cap closing the lower end of the chamber forces the sliding cylinder up the chamber and presses the P.V.C. pad (*p*) against the inlet jet thus sealing it. An outlet (*o*) leads from a point in the chamber opposite the inlet and is connected to the camera case by a short length of polythene tubing. In addition there is a rubber spear valve (*s.v.*) fitted to this side of the system which acts as an exhaust valve.

As the case is taken into the water, increased pressure causes depression of the demand-valve diaphragm which pushes the sliding cylinder down the valve chamber and uncovers the inlet jet. Gas enters until the pressure inside the chamber (and by direct connexion, inside the camera case) is sufficient to raise the diaphragm and close the jet. This process continues as the case is taken deeper until the gas supply is exhausted. On surfacing the gas in the case expands and bubbles out through the spear valve exhaust. The depth at which the valve first opens can be altered by varying the compression on the spring at the base of the valve chamber. In practice it has been found convenient to have the valve set to open at a depth of about 2 m as this eliminates unnecessary wastage of gas due to minor fluctuations in depth during the course of a dive. Theoretically a gas reserve of 3 l. will permit up to three dives of 10 m or one dive of 30 m. The purpose of the on/off valve is to shut off the supply of gas between two shallow dives and thus reduce the strain on the demand valve.

Prior to fitting the pressurizing device it was found that at a depth of 10 or 12 m there was sufficient distortion of the camera case to permit the influx of water around the lid, which invariably resulted in failure of the 'flash'

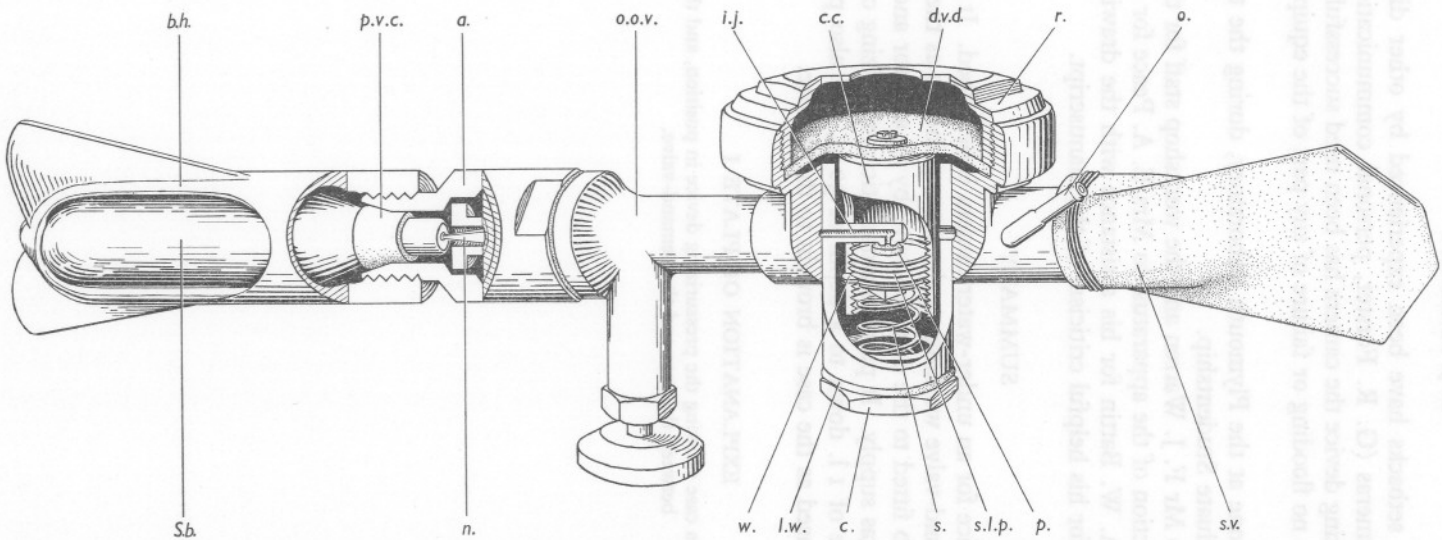

Fig. 1. Semi-diagrammatic cut-away view of the pressurizing device. *S.b.*, Sparklet bulb; *b.h.*, Sparklet bulb holder; *p.v.c.*, small piece of p.v.c.tubing acting as a gas-tight seal; *a*, adaptor; *n*, steel needle for piercing Sparklet bulb; *o.o.v.*, on/off valve; *i.j.*, demand-valve inlet jet; *c.c.*, central cylinder of the demand-valve; *d.v.d.*, demand-valve diaphragm; *p*, small p.v.c. pad; *s.l.p.*, square-lugged plug; *w*, washer with square hole and a lateral projection; *s*, spring; *l.w.*, leather washer effecting seal; *c*, cap closing lower end of the demand-valve; *o*, outlet to the camera case; *s.v.*, spear valve.

equipment. These setbacks have been experienced by other divers using non-pressurized cameras (G. R. Forster, personal communication). Since fitting the pressurizing device the camera has been used successfully to 26 m and there has been no flooding or failure of any part of the equipment.

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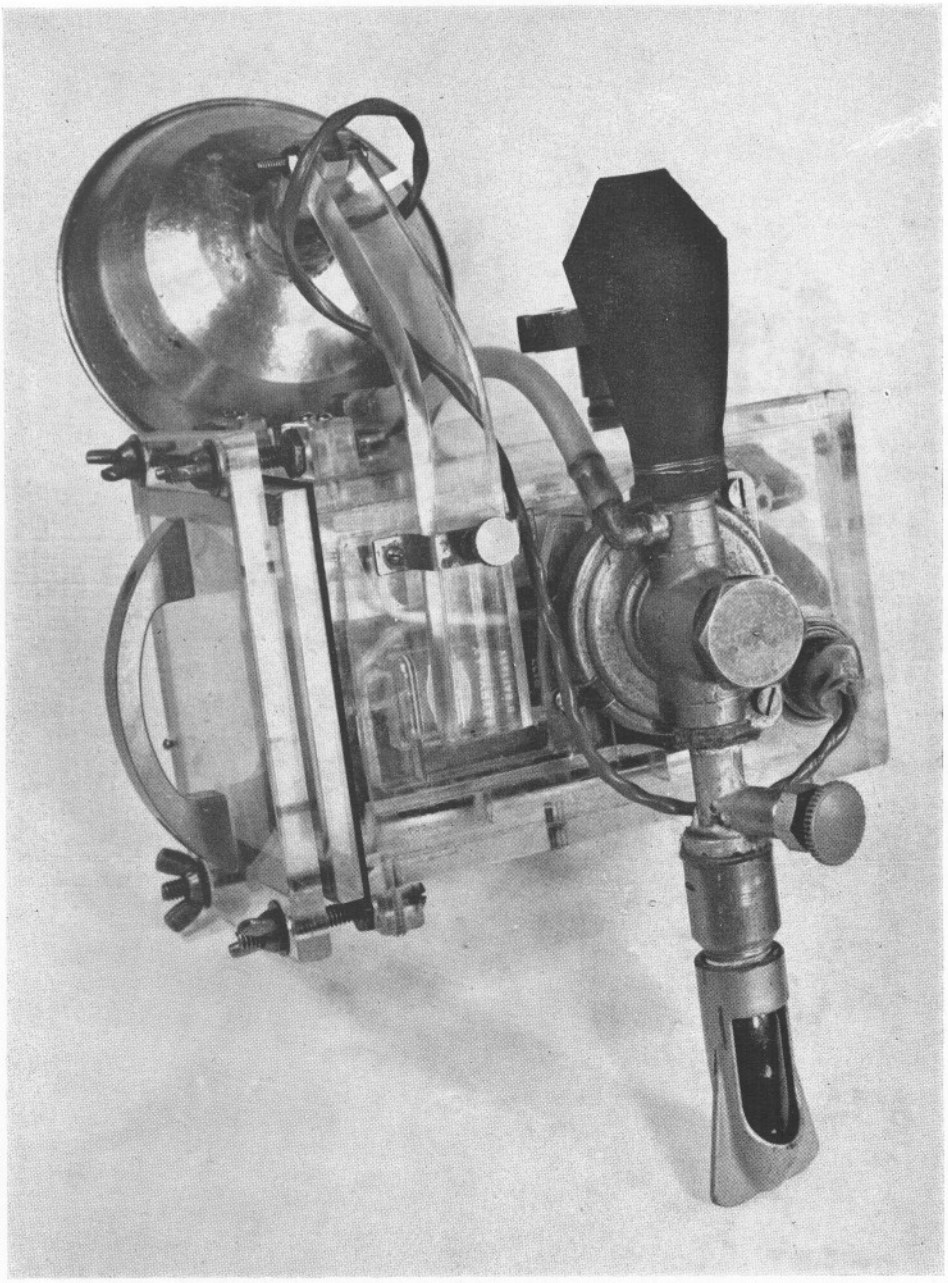
SUMMARY

A pressurizing device for an under-water camera is described. It consists of a single stage demand-valve working on the same principle as the aqualung, and a Sparklet bulb fitted to the demand-valve by an adaptor and an on/off valve is used as a gas supply. It permits automatic pressurizing of a camera case with a volume of 1 l. down to a depth of 30 m, and also permits the pressure to be released as the case is brought to the surface.

EXPLANATION OF PLATE I

Rear view of the camera case showing the pressurizing device in position, and the connexion between the case and the demand-valve.



(*Facing p.* 80)